

First record of *Scaphiodontophis annulatus* (Duméril, Bibron & Duméril, 1854) (Squamata, Sibynophiidae) from Serranía Montes de María, department of Sucre, Colombia

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Abstract. We present a new record of *Scaphiodontophis annulatus* (Duméril, Bibron & Duméril, 1854) from Serranía Montes de María, department of Sucre, Colombia. This represents the second record of this species from the Colombian Caribbean region and the first from a tropical dry forest habitat. We discuss color variation across this species range, as the taxonomy of this species remains unresolved.

Key words. Colombian Caribbean region, distribution range, neck-band snake, seasonal tropical dry forest, taxonomy

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INTRODUCTION

The Neotropical neck-band snakes of the genus *Scaphiodontophis* (Squamata, Sibynophiidae) currently comprise two species, *S. annulatus* (Duméril, Bibron & Duméril, 1854) and *S. venustissimus* (Günther, 1894) (Uetz et al. 2023). These snakes occur in Central and South America, where they inhabit humid forest habitats from sea level to 1550 m a.s.l. (Savage and Slowinski 1996; Chen et al. 2013; Wallach et al. 2014). *Scaphiodontophis* snakes are highly variable in color throughout their geographic ranges (Savage and Slowinski 1996). Their taxonomy remains unclear (Savage and Slowinski 1996; Chen et al. 2013).

Scaphiodontophis dugandi (Roze, 1969) was originally described based on two specimens from north-western Colombia; Roze (1969:356) characterized the species as having: “... transverse bands of red, black, and white on the anterior portion of body and on the tail, whereas the intermediate portion of body is gray speckled with dark, and with three longitudinal lines of dark spots. Furthermore, it has fewer maxillary teeth (39–41) than other known species in the genus (43–46)”. Morgan (1973) later suggested that *S. dugandi* is a junior synonym of *S. annulatus*, given that it has similar color patterns, with a red neck collar and black longitudinal lines on a brown background posteriorly and on the tail. Morgan (1973) also recognized another species, *S. venustissimus*, based on a lower subcaudal scale count than *S. annulatus*. Subsequently, Smith et al. (1986) concluded that *S. annulatus* should be recognized as the only valid species of *Scaphiodontophis*, but divided it into five subspecies, or geographic units. Among these subspecies is *S. annulatus dugandi*, which is restricted to Colombia (Savage and Slowinski 1996). This classification was questioned by McCranie (2006), who proposed the existence of two taxa (*S. annulatus* and *S. venustissimus*), based on differences in the number of subcaudal scales and color pattern (both dorsal and subcaudal); so, he suggested resurrecting *S. venustissimus* from the synonymy of *S. annulatus*. However, the greatest number of characters supporting many snake taxa are shared between the two northern and southern populations (sensu Savage and Slowinski 1996).

All *Scaphiodontophis* exhibit a long tail with urotomy (pseudoautotomy) without regeneration (Savage and Slowinski 1996), and coloration patterns resembling those found in venomous coral snakes of the genus *Micrurus* Wagler, 1824 (Henderson 1984). These characteristics have been regarded as putative defense mechanisms, providing protection against potential predators (Henderson 1984).



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Scaphiodontophis annulatus is known for its diurnal habits and typically inhabits leaf litter of humid forests (Savage 2002). In Colombia, this species has a trans-Andean distribution, with records from humid forests in the Gulf of Urabá, Caribbean region (department of Córdoba), Aburrá Valley (department of Antioquia), and the middle Magdalena Valley in the departments of Boyacá, Santander, Caldas, and Tolima (Roze 1969; Castaño-Mora et al. 2004; Llano-Mejía et al. 2010; Rojas-Morales et al. 2018; Carvajal-Cogollo et al. 2020).

Although the Caribbean region of Colombia is a high-priority area for biodiversity, understanding of its reptile fauna remains notably incomplete (Carvajal-Cogollo et al. 2012). This knowledge gap is exemplified by mountainous regions like the Serranía Montes de María in the departments of Sucre and Bolívar, whose biological richness is likely underestimated (Galván-Guevara and de la Ossa-Velásquez 2009). Here, we present the first record of *S. annulatus* from a tropical dry forest in this mountain massif. We also present an updated distribution map for the species and discuss its morphological variation across its known range.

METHODS

The Serranía Montes de María comprises a low hill system located between the departments of Sucre and Bolívar in the Caribbean region of Colombia. Fieldwork conducted between 2021 and 2023 at El Cedral village, La Colina farm, municipality of Chalán (department of Sucre), resulted in the finding of two specimens of *S. annulatus* (one collected). The specimens were identified using morphological traits (e.g. measurements, scalation, and coloration) following Roze (1969), Savage and Slowinski (1996), and Savage (2002). The voucher specimen was fixed in 10% formaldehyde solution, and then preserved in 70% ethanol. We deposited it in the Reptiles collection of the Museo de Historia Natural Luis Gonzalo Andrade of the Universidad Pedagógica y Tecnológica de Colombia, Tunja, Boyacá, Colombia (**UPTC-RE**). For the updated distributional map of *S. annulatus*, we incorporated records from Colombia and Central America (Roze 1969; Castaño-M et al. 2004; Llano-Mejía et al. 2010; Rojas-Morales et al. 2018; Carvajal-Cogollo et al. 2020).

McCranie (2006) considered the populations from Nicaragua to Colombia to be *Scaphiodontophis venustissimus*, but the two individuals found by us have greater morphological similarity with the specimens described as *S. dugandi* (Roze 1969) and later referred to as *S. annulatus* for the “southern populations” (Savage and Slowinski 1996) than with the Central American populations for which McCranie (2006) resurrected *S. venustissimus*. For this reason, we refer our individuals to *S. annulatus* until the intrageneric relationships of *Scaphiodontophis* are clarified, for which there is no doubt that the inclusion of molecular characters in the analysis is required (Rojas-Morales et al. 2018), to corroborates the phenetic proposed by Savage and Slowinski (1996).

RESULTS

We provide a new confirmed record of *S. annulatus* based on two observations from the Serranía Montes de María, department of Sucre, Colombia (Figure 1). The first individual was observed and photographed (not collected) in February 2021 (Figure 2A). Later, on February 21, 2023, we found and collected a dead individual around the same location, with the assistance of a local resident (Figure 2C, D). The first record of this species from the Colombian Caribbean region comes from rain forest in southern Córdoba department (Carvajal-Cogollo et al. 2020) (Fig. 2B). Thus, the new record presented here constitutes the second observation of this species from tropical dry forest habitats from the Caribbean region of Colombia, added to the record of Roze (1969) in the in the department of Antioquia, municipality of Turbo near the Currulao River.

Scaphiodontophis annulatus (Duméril, Bibron & Duméril, 1854)

New records. COLOMBIA – SUCRE • Municipality of Chalán, El Cedral village, La Colina farm; 09°34'26"N, 075°18'12"W; 420 m alt.; 15.II.2021; O.A. Sierra-Serrano obs.; 1 adult (Figure 2A) • same locality; 21.II.2023; O.A. Sierra-Serrano leg.; 1 adult ♀; UPTC-RE 01522 (Figure 2C, D).

Identification. The collected specimen fits the general description of the species (Roze 1969; Savage and Slowinsky 1996) and is characterized as follows: snout–vent length = 295 mm; total length = 208 mm; dorsal scale counts 17-17-17; ventrals 136; subcaudals 101; supralabials 8 (3, 4, 5 in contact with eye); infralabials 9; prefrontals 2, frontonasals 2. In both individuals, observed and collected, the head had black extending towards the parietals, with white temporal scales marked with brown, and the snout had a thin, brown-stained, white band that crosses the loreal, preocular, posterior portions of the prefrontals, and anterior portion of the frontal. A black neckband extended six scales long. The first third of the body presented incomplete rings of four black-white-black dyads, separated by red bands speckled with black and covering 10 dorsal scales in length. The midpart of the body was brown with a salt-and-pepper pattern, and the tail had dyads, triads, and tetrads with red bands ranging from 10 to 13 scales in length (Figure 2A, C, D).

Natural History. Both individuals of *S. annulatus* were recorded in the leaf litter of a seasonal tropical

Figure 1. Map of Central America and northern South America showing the distribution of the genus *Scaphiodontophis*. Green points indicate records of the genus across Central and South America; the yellow point indicates the record from the municipality of Tierralta, South of the department of Córdoba (Carvajal-Cogollo et al. 2020) and the orange point indicates the record from the municipality of Turbo, department of Antioquia (Roze 1969). The purple point shows the new record from Serranía Montes de María, department of Sucre, Colombia.

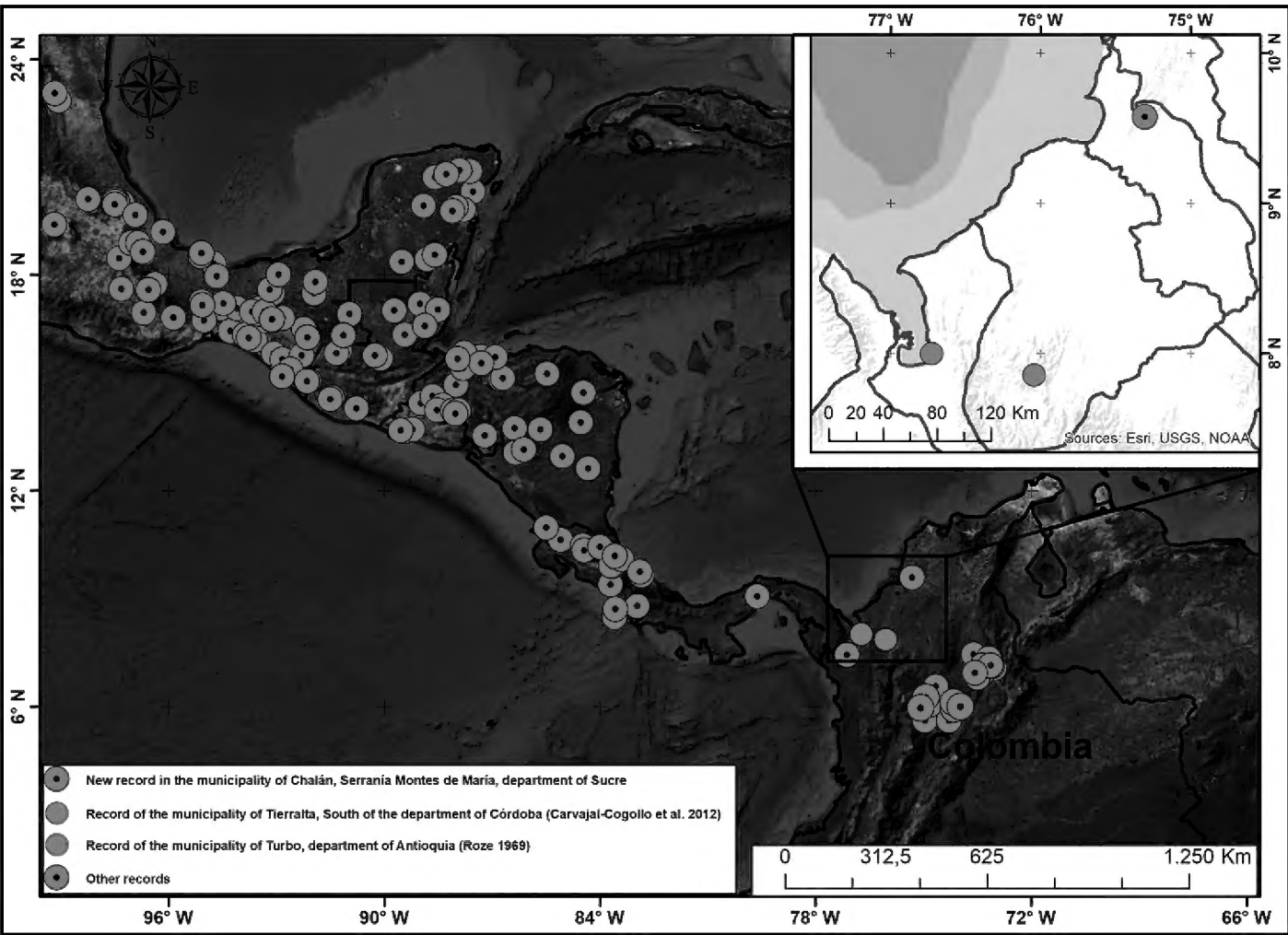
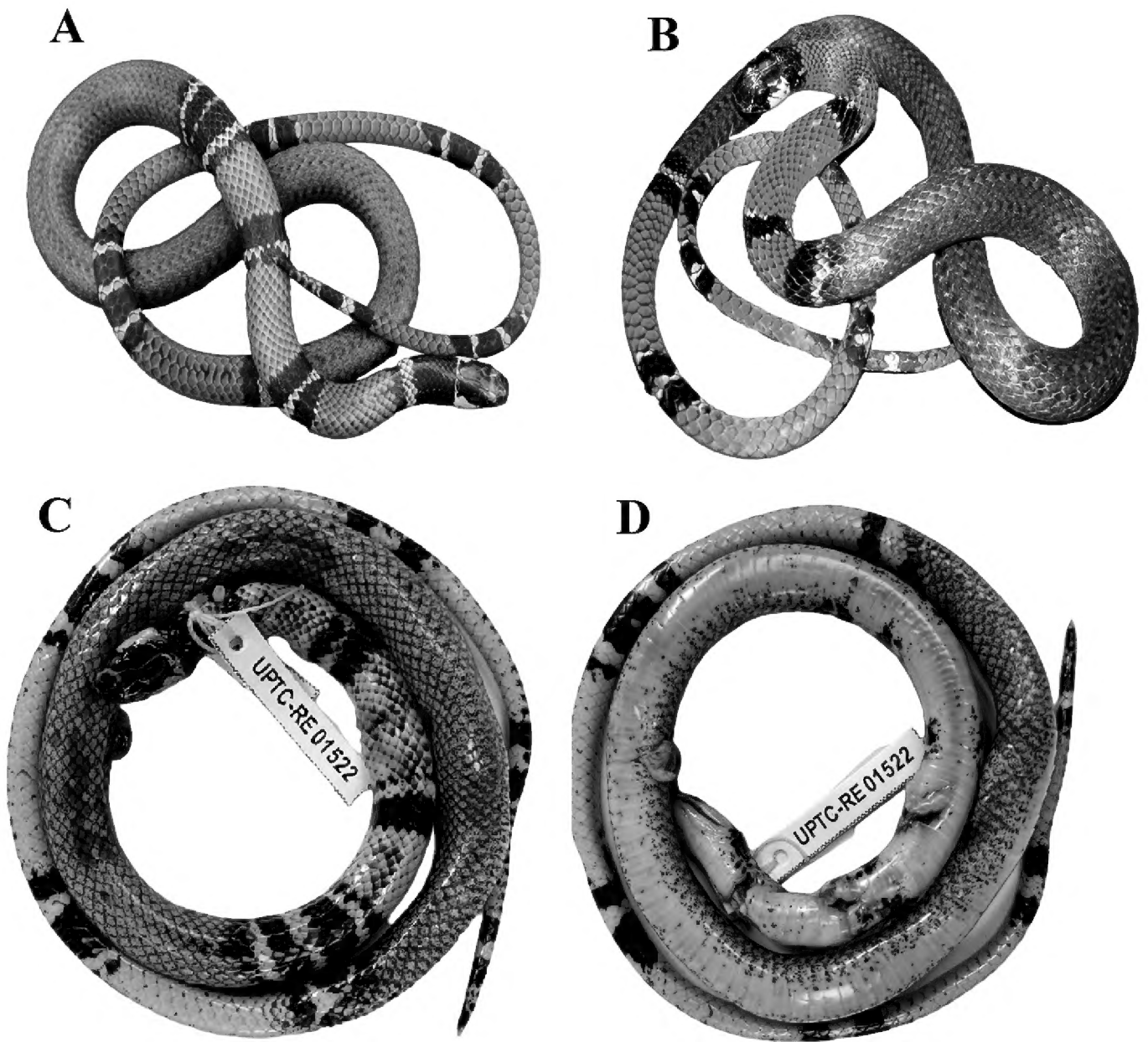


Figure 2. Colombian individuals of *Scaphiodontophis annulatus*. **A.** Individual from Montes de María, municipality of Chalán, Sucre, Colombia observed in February 2021. Photo by OASS. **B.** Specimen from the department of Córdoba (Carvajal-Cogollo et al. 2020). Photo by Cristina Estupiñán. **C–D.** Preserved specimen UPTC-RE 01522 from Montes de María, municipality of Chalán, Sucre, Colombia. Photos by JECC.



dry forest, but the area is a mosaic landscape of small and medium-sized forest fragments surrounded by extensive areas dedicated to cattle grazing. This is one of the areas most affected by loss and fragmentation of native tropical dry forest in the Caribbean region of Colombia (Carvajal-Cogollo et al. 2020).

DISCUSSION

We present the first record of *Scaphiodontophis annulatus* from the Serranía Montes de María, which represents the northernmost record in Colombia (Fig.1). This record extends the range of the species more than 200 km northeast from previously known records in the Colombian Caribbean region—specifically, by 207 km from the southern department of Córdoba (Carvajal-Cogollo et al. 2012), and by 234 km from the type locality of the subspecies *S. annulatus dugandi* in the region of Urabá (Roze 1969), near the municipality of Turbo, Currulao River, department of Antioquia. Our record represents the first observation of this species in dry-forest ecosystems; the known distribution of the species in both Central America and Colombia was thought to be restricted to tropical rainforest areas (Roze 1969; Savage 2002; Castaño-M et al. 2004; Llano-Mejia et al. 2010; Rojas-Morales et al. 2018; Carvajal-Cogollo et al. 2020, 2022). Our new records add to the taxonomic affinities between the biota of the Montes de María and the humid forests of the Chocó and reinforces the hypotheses of historical biogeographical connectivity of these sectors of the department of Sucre with the humid forests of the mountain foothills of Colombia, the middle valley of the Magdalena River, and the Biogeographic Chocó (e.g. Castaño-M et al. 2004; Moreno-Arias et al. 2008; Acosta-Galvis 2012, Meza-Joya et al. 2020). Despite its wide distribution in Central America and northern South America, *S. annulatus* has both few confirmed observations and records supported by specimens in collection (Savage and Slowinski 1996; Chen et al. 2013; Wallach et al. 2014). This fact, combined with the inherent rarity of *S. annulatus*, a common characteristic among many snake species (e.g. Meza-Joya et al. 2020), limits our understanding of the full extent of its distribution, its natural history, and its capacity to adapt to contrasting ecosystems as reported here.

Interestingly, *Scaphiodontophis* snakes exhibit high levels of color polymorphism across the entire range of the genus (Savage and Slowinski 1996). This variability has led to uncertainties about the taxonomic identity of *S. annulatus* as a single taxon and has been inferred as an indicative of cryptic diversity (Savage 2002) or the assignment of subspecies ranks to geographic units (e.g. Smith et al. 1986), such as *S. annulatus dugandi*, *S. annulatus nothus* (Taylor & Smith, 1943), and *S. annulatus hondurensis* (Schmidt, 1936). In the most comprehensive study on this species taxonomy to date, Savage and Slowinski (1996) revealed intermediate forms in ontogenetic and geographic coloration patterns between populations in Colombia and Panama. This finding prevented Savage and Slowinski (1996) from formally recognizing distinct species between Central and South America, yet auxiliary genetic data is required to validate this inference (e.g. Guo et al. 2023). This type of study will provide a better understanding of the systematics, phylogenetic relationships, and diversity of the genus across its Neotropical range.

We identify our record as *Scaphiodontophis annulatus*. McCrane (2006) proposed that Central American populations from Nicaragua southward to Colombia should be considered as *S. venustissimus*, and he revalidated *S. venustissimus* based on differences in the number of subcaudal scales and color patterns (both dorsal and subcaudal) and suggested the removal of *S. venustissimus* from the synonymy of *S. annulatus*. However, many of the key characteristics used to distinguish snake taxa are shared between the northern and southern populations (sensu Savage and Slowinski 1996). Additionally, Colombian populations in the biogeographic Chocó and the middle basin of the Magdalena River retain characteristics of both northern and southern populations according to the morphological and colorimetric traits described by Savage and Slowinski (1996). Various authors, based on their morphological observations and characterizations, have identified *Scaphiodontophis* specimens from several localities in Colombia as *S. annulatus* (Castaño-Mora et al. 2004; Lynch et al. 2014; Rojas-Morales et al. 2018; Chaves-Ramírez et al. 2021; Zúñiga-Baos et al. 2023). Therefore, we prefer to refer to our individuals as *S. annulatus* until the intrageneric relationships of *Scaphiodontophis* are clarified. There is no doubt that the inclusion of molecular characters in the analysis is required to corroborate the phenetic hypothesis proposed by Savage and Slowinski (1996) (Rojas-Morales et al. 2018).

Notably, the specimens reported here exhibit a distinct color pattern which contrasts with that documented for this species in Colombia. Indeed, specimens from southern Córdoba department exhibit a monadal pattern featuring individual black rings surrounded by two narrow white rings on the first third of the body (Carvajal-Cogollo et al. 2020; Figure 2B). This pattern has also been reported from specimens in the eastern region of Urabá, as in the original description of *Scaphiodontophis dugandi*, as well as in Samaná, department of Caldas (Rojas-Morales et al. 2018), and for Central American populations considered as *S. venustissimus* (McCrane 2006; Köhler 2008; Salazar-Saavedra et al. 2018) and for others from Costa Rica considered as *S. annulatus* (Savage 2002). This situation increases the uncertainty about the taxonomic identity of the Central and South American specimens of the genus *Scaphiodontophis* and shows the need for in-depth studies of integrative taxonomy based on the complete studies of Savage and Slowinski (1996) and the interpretations given by McCrane (2006). In contrast, specimens from dry forests in the Serranía Montes de María are characterized by dyads of black rings in the anterior third portion of the body (Figure 2A, C, D). Thus, apart from expanding the ecological information available for the species, our results contribute a new piece to the taxonomic puzzle surrounding *S. annulatus* and reveal novel geographic patterns of color variation.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Author contributions

Conceptualization: CJCP, OASS, JTM, JECC. Data curation: JECC. Formal analysis: CJCP, JECC. Investigation: CJCP, OASS, JTM, JECC. Writing – original draft: CJCP, OASS, JTM, JECC. Writing – review and editing: CJCP, JECC.

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Data availability

All data that support the findings of this study are available in the main text.

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